

AMENDMENTS TO THE SPECIFICATION

Replace the paragraph from page 8, line 13 to page 9, line 3 with the following paragraph.

Various inorganic powders other than carbon black may be added to the non-magnetic layer. Examples of the inorganic powders include needle-shaped non-magnetic iron oxide ( ~~$\alpha$ - $\text{Fe}_2\text{O}_3$~~ ) ( $\alpha$ - $\text{Fe}_2\text{O}_3$ ),  $\text{CaCO}_3$ , titanium oxide, barium sulfate, and  ~~$\alpha$ - $\text{Al}_2\text{O}_3$~~   $\alpha$ - $\text{Al}_2\text{O}_3$ . Preferably, the inorganic powder contains minimal amounts of water-soluble sodium ions and water-soluble calcium ions: water-soluble sodium ions are preferably contained in an amount of 70ppm or less, more preferably 50ppm or less. When contained in amounts greater than the specified range, the water-soluble sodium ions may form salts with organic acids (in particular, fatty acids) present in the coating. Such salts may seep out to the surface of the coating, causing drop-outs or an increase in the error rate. To minimize the amounts of the water-soluble sodium ions and the water-soluble calcium ions, the inorganic powders may be washed with water.

Replace the paragraph at page 19, lines 6-22, with the following paragraph.

A preferred ferromagnetic powder for use in the present invention is a magnetic metal powder or a planar hexagonal fine powder. The magnetic metal powder preferably has a coercive force  $H_c$  of 118.5 to 237kA/m (1500 to 3000Oe), a saturation magnetization ~~ss~~  $\sigma_s$  of 120 to 160Am<sup>2</sup>/kg (emu/g), an average major axis length of 0.03 to 0.1 $\mu$ m, an average minor axis length of 10 to 20nm, and an aspect ratio of 1.2 to 20. Also, the magnetic recording medium made by using the magnetic metal powder preferably has an  $H_c$  value of 118.5 to 237kA/m (1500 to 3000Oe). The planar hexagonal fine powder preferably has a coercive force  $H_c$  of 79 to 237kA/m (1000 to 3000Oe), a saturation magnetization ~~ss~~  $\sigma_s$  of 50 to

70Am<sup>2</sup>/kg (emu/g), an average planar particle size of 30 to 80nm, and a plate ratio of 3 to 7.

Also, the magnetic recording medium made by using the planar hexagonal fine powder preferably has an Hc value of 94.8 to 173.8kA/m (1200 to 2200Oe).

Replace the paragraph from page 20, line 21 to page 21, line 9 with the following paragraph.

The production of the magnetic metal powder uses a ferric oxyhydrate as a starting material. This material can be obtained by blowing an oxidative gas through an aqueous suspension of a ferrous salt and an alkali. A preferred ferric oxyhydrate is ~~a-FeOOH~~ α-FeOOH. In a first process for producing ~~a-FeOOH~~ α-FeOOH, a ferrous salt is neutralized with an alkali hydroxide to form an aqueous suspension of Fe(OH)<sub>2</sub>, and an oxidative gas is then blown into the suspension to form a needle-shaped ~~a-FeOOH~~ α-FeOOH product. In a second process for producing ~~a-FeOOH~~ α-FeOOH, a ferrous salt is neutralized with an alkali carbonate to form an aqueous suspension of FeCO<sub>3</sub>, and an oxidative gas is then blown into the suspension to form a spindle-shaped ~~a-FeOOH~~ α-FeOOH product.

Replace the paragraph from page 21, line 17 to page 22, line 8 with the following paragraph.

In the first process, it is preferred to use 2 to 10 times as much alkali as required to neutralize the ferrous salt, so that the oxidation of Fe(OH)<sub>2</sub> takes place under highly basic conditions. The ~~a-FeOOH~~ α-FeOOH product obtained in this manner is suitable for making a magnetic metal powder that is fine, has no branches, and offers a high dispersibility and a high packing ability. It is necessary that the process be carried out under highly basic conditions to ensure that the resulting particles are unbranched. As it is known, one way to

control the particle size is by controlling the reaction temperature and the volume of the oxidative gas blown into the suspension. Alternatively, the particle size may be controlled by carrying out the neutralization of the ferrous salt with the alkali in the presence of a metal salt, such as a salt of Ni, Co, Al, and Si, and then carrying out the oxidation.

Replace the paragraph at page 22, lines 9-17, with the following paragraph.

The second process tends to produce fine particles of a spindle-shaped, unbranched  $\alpha$ -~~FeOOH~~  $\alpha$ -FeOOH product that have uniform particle sizes. In the second process, the particle size can be controlled by varying the ferrous concentration in the aqueous suspension, the reaction temperature, and the volume of the oxidative gas blown into the suspension. As with the first process, the particle size can also be controlled by the addition of Ni, Co, or the like.

Replace the paragraph from page 22, line 18 to page 23, line 8 with the following paragraph.

One exemplary method for producing a magnetic metal powder will now be described in which the needle-shaped  $\alpha$ -~~FeOOH~~  $\alpha$ -FeOOH product obtained in the first process is used as a starting material. First, ferrous salt is neutralized with twice as much or more of an alkaline hydroxide as is required to just neutralize the ferrous salt to form an alkaline suspension of  $\text{Fe}(\text{OH})_2$ . An oxidative gas is then blown into the suspension to obtain a needle-shaped  $\alpha$ -~~FeOOH~~  $\alpha$ -FeOOH product. To control the needle-shaped ratio and the shape of the  $\alpha$ -~~FeOOH~~  $\alpha$ -FeOOH product, the ferrous salt may be doped with metals such as Ni, Co, Zn, Cr, Mn, Zr, Al, Si, P, Ba, Ca, Mg, Cu, Sr, Ti, Mo, Ag, and rare earth elements. These heterogenous metals may be uniformly mixed with the ferrous salt or they may be

added during the reaction. The amounts added can be empirically determined by the desired shape and the size of the product.

Replace the paragraph at page 23, lines 9-19, with the following paragraph.

In this process, the ferrous salt is neutralized with an alkali to form a suspension of  $\text{Fe}(\text{OH})_2$ , which is then oxidized to produce  ~~$\alpha\text{-FeOOH}$~~   $\alpha\text{-FeOOH}$ . By using twice as much or more of the alkaline as is required to neutralize the ferrous salt, the resultant  ~~$\alpha\text{-FeOOH}$~~   $\alpha\text{-FeOOH}$  can be used as a starting material to produce a magnetic metal powder with high coersive force. While the degree of branching of the resulting  ~~$\alpha\text{-FeOOH}$~~   $\alpha\text{-FeOOH}$  can be further reduced by adding the alkali in larger excess, the alkali, when added in excessive amounts of 10 times or more, does not further improve the effect and thus is not effective.

Replace the paragraph at page 23, line 20 to page 24, line 8 with the following paragraph.

Also, it is necessary that the  ~~$\alpha\text{-FeOOH}$~~   $\alpha\text{-FeOOH}$  particles required to produce a favorable magnetic metal powder have a size such that its specific surface area as measured in BET value falls within the range of 60 to 130m<sup>2</sup>/g. The specific surface area that is less than 60m<sup>2</sup>/g indicates that the particles are too large to provide a high coersive force and thus are not suitable as a magnetic material used in a single wavelength region. In comparison, the specific surface area that is greater than 130m<sup>2</sup>/g indicates that the particles are too small to provide a high coersive force although they may exhibit superparamagnetism. Too large a specific surface area also indicates a wide distribution of coersive force, which may be due to non-uniform particles.

Replace the paragraph at page 24, line 9 to page 25, line 7 with the following paragraph.

Next, at least one of Ni, Co, Al, Si and rare earth elements is added to the ~~a-FeOOH~~  $\alpha$ -FeOOH, which may or may not be doped with Ni, Co, Zn, Cr, Mn, Zr, Al, Si, P, Ba, Ca, Mg, Cu, Sr, Ti, Mo, Ag, and a rare earth element. The addition is typically carried out by neutralizing different metal salts with an acid or an alkali to deposit film of fine crystals of hydroxides on the surface of the particles. While Ni, Co, and rare earth elements may not have to be deposited on the surface of the ~~a-FeOOH~~  $\alpha$ -FeOOH particles, provided that the ~~a-FeOOH~~  $\alpha$ -FeOOH product is doped with sufficient amounts of the dopants, these elements may be further deposited on the surface of the particles when it is desired to increase the amounts of the elements present in the ~~a-FeOOH~~  $\alpha$ -FeOOH product since the ~~a-FeOOH~~  $\alpha$ -FeOOH product can only be doped to a limited degree. The metal elements are preferably present in the magnetic metal powder in the following ranges, where figures indicate the ratio by mass of each metal assuming the mass of iron to be 100:

Ni = 0.3 – 8.0

Co = 3.0 – 45.0

Al = 0.5 – 8.0

Si = 0.5 – 8.0 and

rare earth element = 0.2 – 10.0,

provided that Al + Si = 2.0 – 15.0.

Replace the paragraph at page 25, lines 8-22, with the following paragraph.

The rare earth metal is at least one selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Dy, and Y. The metals may be effectively used in combinations. Preferably, the metals are added in the form of water-soluble salts, such as chlorides, sulfates, and nitrates. Si is preferably added in the forms of sodium metasilicate, sodium orthosilicate, and water-glass. The metals are deposited in the following order: First, Ni and Co, which form an alloy and serve to control magnetic characteristics of the magnetic metal powder, are deposited, followed by deposition of Al and Si, which serve to prevent the sintering of the particles by heat. The rare earth metals, which act to increase a  $\alpha$  force, can achieve the effect more significantly when they are present internally, though they are somewhat effective when deposited with Al and/or Si.

Replace the paragraph at page 25, line 23 to page 26, line 12 with the following paragraph.

After predetermined amounts of the metals have been deposited, the metals are thoroughly washed with water, are dried, and are then heat-treated at 300 to 800°C in a non-reductive atmosphere. If the heat treatment is carried out at temperatures below 300°C, then the resulting  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> particles, generated in the dehydration of  ~~$\alpha$ -FeOOH~~  $\alpha$ -FeOOH, tend to contain numerous pores. As a result, the characteristics of the reduced magnetic metal powder are deteriorated. On the other hand, if the heat treatment is carried out at temperatures higher than 800°C, then the  ~~$\alpha$ -Fe<sub>2</sub>O<sub>3</sub>~~  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> particles start to melt and are deformed or sintered. As a result, the characteristics of the resulting magnetic metal powder are deteriorated.

Replace the paragraph at page 29, lines 12-24, with the following paragraph.

The magnetic layer further contains an abrasive having a Mohs hardness of 6 or higher for the purposes of increasing the mechanical strength of the magnetic layer and preventing clogging of the magnetic head. Examples of the abrasives are those with a Mohs hardness of 6 or higher, preferably 9 or higher, including ~~a-alumina~~  $\alpha$ -alumina (Mohs hardness = 9), chromium oxide (Mohs hardness = 9), silicon carbide (Mohs hardness = 9.5), silicon oxide (Mohs hardness = 7), aluminum nitride (Mohs hardness = 9), and boron nitride (Mohs hardness = 9.5). Preferably, at least one of these abrasives is added to the magnetic layer. The abrasives are generally amorphous and thus serve to prevent clogging of the magnetic head and to increase the coating strength.

Replace the paragraph at page 35, line 16 to page 36, line 6 with the following paragraph.

Aside from carbon black, the back coat layer may further contain various non-magnetic inorganic powders to control the mechanical strength of the magnetic recording medium. Examples of such inorganic powders include ~~a-Fe<sub>2</sub>O<sub>3</sub>~~  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>, CaCO<sub>3</sub>, titanium oxide, barium sulfate, and ~~a-Al<sub>2</sub>O<sub>3</sub>~~  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>. The amount of the non-magnetic inorganic powder is preferably in the range of 0.1 to 20 parts by mass, and more preferably in the range of 0.5 to 15 parts by mass, with respect to 100 parts by mass of carbon black. The non-magnetic inorganic powder preferably has an average particle size of 0.01 to 0.5  $\mu$ m. Too small an amount of the non-magnetic inorganic powder may lead to insufficient mechanical strength of the back coat layer, whereas too large an amount of the powder may result in substantial abrasion of guide members that slide against the tape or may cause scratches on the magnetic layer.

Replace the paragraph at page 46, lines 10-12 with the following paragraph.

Needle-shaped ~~a-Fe<sub>2</sub>O<sub>3</sub>~~  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> 85 parts by mass

(TODA KOGYO, DB-65, average major axis length = 0.11 $\mu$ m, BET(specific surface area) = 53m<sup>2</sup>/g)

Replace the paragraph at page 46, lines 16-18, with the following paragraph.

~~a-Al<sub>2</sub>O<sub>3</sub>~~  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> 5 parts by mass

(SUMITOMO CHEMICAL Co., Ltd., HIT-60A, average particle size = 0.20 $\mu$ m)

Replace the paragraph at page 49, lines 1-3, with the following paragraph.

~~a-Fe~~  $\alpha$ -Fe magnetic powder 100 parts by mass

(Hc=1885Oe, Co/Fe=20at%, ss  $\sigma_s$ =138emu/g, BET=58m<sup>2</sup>/g, average major axis length = 0.10 $\mu$ m)

Replace the paragraph at page 49, lines 4-6, with the following paragraph.

~~a-Al<sub>2</sub>O<sub>3</sub>~~  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> 6 parts by mass

(SUMITOMO CHEMICAL Co., Ltd., HIT-60A, average particle size = 0.20 $\mu$ m)



Replace the paragraph at page 49, lines 7-9, with the following paragraph.

~~a-Al<sub>2</sub>O<sub>3</sub>~~ α-Al<sub>2</sub>O<sub>3</sub> 6 parts by mass

(SUMITOMO CHEMICAL Co., Ltd., HIT-82, average particle size = 0.13μm)

Replace the paragraph at page 52, lines 11-13, with the following paragraph.

~~a-almina~~ α-almina 1 part by mass

(TAIMEI CHEMICALS Co., Ltd., TM-DR, average particle size = 0.23μm)